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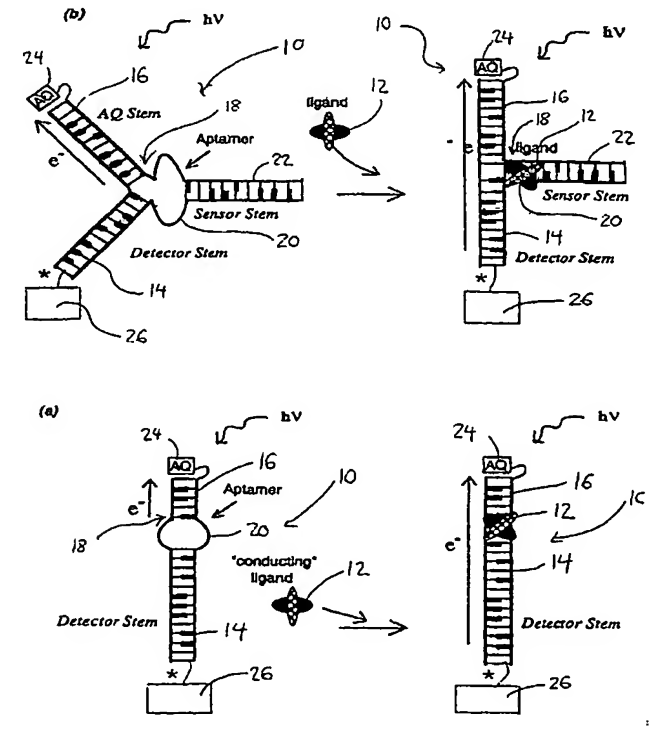
(54) Title: DNA CONFORMATIONAL SWITCHES AS SENSITIVE ELECTRONIC SENSORS OF ANALYTES




(57) Abstract: The electrical conductivity of DNA and other oligonucleotide constructs is dependent on its conformational state. Such a dependence may be harnessed for the electronic sensing of external analytes, for instance, adenosine. Such a DNA sensor incorporates an analyte receptor, whose altered conformation in the presence of bound analyte switches the conformation, and hence, the conductive path between two oligonucleotide stems, such as double-helical DNA. Two distinct designs for such sensors are described that permit significant electrical conduction through a first or "detector" double-helical stem only in the presence of the bound analyte. In the first design, current flows through the analyte receptor itself whereas, in the second, current flows in a path adjacent to the receptor. The former design may be especially suitable for certain categories of analytes, including heterocycle-containing compounds such as adenosine, whereas the latter design should be generally applicable to the detection of any molecular analyte, large or small. Since analyte detection in these DNA sensors is electronic, the potential exists for their application in rapid and automated chip-based detection of small molecules as well as of proteins and other macromolecules.

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